

Paramedic Mini-CAT

Title: Pulmonary edema and CPAP

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Clinical Scenario: You and your partner respond code 4 for a 75-year-old male with difficulty breathing. Your differential diagnosis for your patient is that he is suffering from acute pulmonary edema. You discuss administering CPAP with your partner, however, your partner is not sure that is the best decision. You decide to give the patient CPAP because you are the primary, but no nitro, as he took a phosphodiesterase inhibitor last night. On route the patient deteriorates and you have to intubate him. If you didn't CPAP the patient, would he have had the same likelihood of being intubated?

PICO: Do patients with acute pulmonary edema who receive CPAP vs standard prehospital treatment have the same intubation rate?

Reproducible Search:

EBSCO: MEDLINE

Search ID	Search Terms	Search options	Outcomes
S16	S3 AND S6 AND S11 AND S14	Published: 20110101-20161231	10
S15	S3 AND S6 AND S11 AND S14		16
S14	S12 OR S13		23, 232
S13	Endotracheal intubation		13, 701
S12	Intubation rates		12, 500
S11	S7 OR S8 OR S9 OR S10		76, 760
S10	paramedic		4, 499
S9	Emergency medical technician		6, 017
S8	Emergency medical services		70, 638
S7	Prehospital care		5, 752
S6	S4 OR S5		11, 659
S5	Continuous positive airway pressure		10, 292
S4	CPAP		6, 575
S3	S1 OR S2		29, 028
S2	Pulmonary oedema		29, 008
S1	Pulmonary edema		26, 776

Relevant Papers: 3 papers were chosen as relevant for this mini-CAT because they included all aspects in the PICO question.

EBSCO: CINAHL

Search ID	Search Terms	Search Options	Outcomes
S16	S3 AND S6 AND S11 AND S14	Published: 20110101-20151231	5
S15	S3 AND S6 AND S11 AND S14		13
S14	S12 OR S13		3, 363
S13	Endotracheal intubation		2, 129
S12	Intubation rates		1, 697
S11	S7 OR S8 OR S9 OR S10		35, 895
S10	Paramedic		2, 214
S9	Emergency medical technician		8, 133
S8	Emergency medical services		27, 317
S7	Prehospital care		10, 591
S6	S4 OR S5		3, 156
S5	Continuous positive airway pressure		3, 014
S4	CPAP		1, 132
S3	S1 OR S2		2, 233
S2	Pulmonary oedema		2, 233
S1	Pulmonary edema		2, 233

Relevant Papers: 1 paper was chosen as relevant for this mini-CAT because it included all aspects in the PICO question, however, this article was also found in MEDLINE.

Author	Design	Population	Intervention/ comparison	Outcomes	Results	Strengths/ Weaknesses
Frontin, 2011	Prospective, randomized control, non-blinded trial	124 patients with acute cardiogenic pulmonary edema were enrolled in the study. 62 patients were enrolled in the usual care group and 62 patients were enrolled in the CPAP group. After exclusion criteria was applied, there were 60 patients in the usual care group and 62 patients in the CPAP group.	2 groups were compared: -Usual care group: Furosemide 1 mg/kg; 15 L/min of oxygen delivered by non-rebreather and constant infusion of isosorbide dinitrate at an initial rate of 2 mg/h -CPAP group: They received the same care as the usual care group in addition to receiving CPAP at 10 cm of water	-Primary End Points: Success rate of CPAP and usual care as treatment -Secondary End Points: The impact of early CPAP (as in the need for intubation in the ICU), length of stay in the ICU/hospital, and mortality rates after 30 days	-Usual care group: 22 patients were successfully treated. 1 patient was intubated prehospitally. 3 more patients were intubated in-hospital. Patients spent an average of 8.2 days in ICU and an average of 6 days in hospital. Within 30 days, 10 patients died. -CPAP group: 19 patients were successfully treated. There were no patients who were intubated prehospitally. 2 patients were intubated in-hospital. Patients spent an average of 8 days in the ICU and an average of 6 days in hospital. Within 30 days, 8 patients died.	-Strengths: Determining which patients were placed in which group was very well done, and showed no clear bias. -Weaknesses: The study was conducted in France, where advanced life support prehospitally comes in the form of mobile ICU's. The mobile ICU's contain an emergency physician, a nurse, and an EMT. The results in terms of success rates would be greater with a physician present because of their larger scope of practice rather than an EMT's. An outcome the authors looked at were intubation rates, however, excluded patients from the study if they required immediate intubation upon arrival of the mobile ICU. The sample sizes were very small. The vast majority of the <i>p</i> values

						for the primary and secondary endpoints were over 0.05, indicating that most of the data could have occurred by chance.
Willmore, 2015	Before and after cohort study	373 patients were enrolled in the study exhibiting signs of acute cardiogenic pulmonary edema or exacerbated COPD. After exclusion criteria was applied, there were 177 patients in the non-CPAP group and 164 patients in the CPAP group. Of the 164 patients in the CPAP group, only 31 received CPAP in the pre-hospital setting.	2 groups were compared: -non-CPAP group: symptom relief drugs. -CPAP group: Symptom relief drugs administered were the same for both groups as well as CPAP at an unknown amount of water.	-primary end points: Measure the effectiveness of pre-hospital CPAP on mortality -Secondary End Points: Rates of intubation in the pre-hospital setting and at the emergency department, rates of CPAP in the emergency department, disposition from the emergency department and the patient's length of stay.	-non-CPAP group: 2.1% of patients died in the emergency department. 0 patients were intubated prehospitally. 4.4% of patients were intubated in hospital. 13.4% of patients received CPAP in hospital. 61.5% of patients were admitted to the hospital. 6.9% of patients were admitted to the ICU. The average length of stay in the hospital was 6.8 days. -CPAP group: 4.3% of patients died in the emergency department. 1 patient was intubated prehospitally. 1.5% of patients were intubated in hospital. 20% of patients received CPAP in hospital. 66.1% of patients were admitted to the hospital. 6.7% of patients were admitted to the	-Strengths: The study was being conducted in Ottawa, where almost all ambulances have one BLS medic and one ALS medic present. This would allow for almost every call the medics attended to have an equal chance of intubating a patient as it is an ALS skill. For both study groups they looked at the same 3-month period for 2 years to minimize the likelihood of contracting a certain disease based on the time of the year. -Weaknesses: The authors used very small sample sizes. The authors only used electronic ACR's where the chief complaint was 'shortness of breath' and the return code was 'emergent.' The

					ICU. The average length of stay in the hospital was 8.7 days.	majority of <i>p</i> values for the CPAP group were over 0.05, indicating that most of the data collected could have just been from chance. There was no indication of how much water was used in the treatment of CPAP.
Cheskes, 2013	Before and after observational cohort study	723 patients were enrolled in the study exhibiting signs of acute respiratory distress. 316 patients were enrolled in the before CPAP group, and 322 patients were enrolled in the after CPAP group. After exclusion criteria was applied there were 228 patients in the before group and 214 patients in the after group. Of the 214 patients in the after group, 89 of them received CPAP. Of the 228 patients in the before group, 138 of them had a hospital diagnosis of	4 groups were compared: -before the implementation of CPAP: patients were treated with furosemide, nitroglycerin, oxygen, and ventolin -after the implementation of CPAP: patients were treated with furosemide, nitroglycerin, oxygen, Ventolin, and CPAP at an unknown amount of water -patients diagnosed in-hospital with CHF, COPD or pulmonary edema before the implementation of CPAP:	-Primary End Points: rates of intubation and rates of mortality -Secondary End Points: rates of intubation and mortality rates of patients with a hospital diagnosis of CHF, COPD, or pulmonary edema	-Before group: 17 patients died in-hospital. 29 patients were intubated in hospital. -After group: 17 patients died in-hospital. 31 patients were intubated in-hospital. -CHF, COPD, pulmonary edema diagnoses before group: 3 patients died in-hospital. 16 patients were intubated in-hospital. -CHF, COPD, pulmonary edema diagnoses after group: 8 patients died in hospital. 13 patients were intubated in-hospital.	-Strengths: DNR's as an exclusion criteria helped to ensure that the data would not be skewed when looking at mortality rates. -Weaknesses: The study was conducted in Peel region (Ontario, Canada), where there are ALS crews and BLS crews. The rates of intubation would be skewed if a BLS crew showed up on scene to a patient that required intubation because BLS medics are not trained to do so. When looking at the <i>p</i> values calculated, in regards to comparing CPAP and non-CPAP,

		CHF, COPD or pulmonary edema. Of the 214 patients in the after group, 135 of them had a hospital diagnosis of CHF, COPD, or pulmonary edema.	treated the same as those in the before group above -patients diagnosed in-hospital with CHF, COPD, or pulmonary edema after the implementation of CPAP: treated the same as those in the after group above			most of the values exceed 0.05, indicating that many of those results could have occurred by chance. The sample sizes were too small.
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Comments: There were some difficulties with this PICO question, because very few studies looked at just pulmonary edema as the illness. The rates of intubation are also highly dependent on where the medics are working and their designation. In some regions of the globe, only physicians are able to intubate patients, where in other regions only ALS providers are able to do so. This was seen in Cheskes et al's (2013) study because it was conducted in a region where only ALS medics are able to intubate patients. If BLS medics attended a call where a patient needed to be intubated, they would not be able to because it is not in their scope of practice. There was no record in Cheskes et al's (2013) paper if only ALS medics were used to collect their data. Willmore et al (2015) and Cheskes et al (2013) never mention a level of water that the CPAP mask was operated on, which could have led to differences in results. All of the studies deemed relevant for this mini-CAT had too small of sample sizes for data to be considered statistically significant, with most *P* values in the CPAP groups exceeding 0.05.

Clinical Bottom Line: The data collected is inconclusive in determining whether CPAP changes the rate of intubation in patients suffering from acute pulmonary edema. Further studies need to be conducted in order to have a clearer answer. Studies in the future should focus on larger sample sizes in order for them to be more statistically significant.

References:

Cheskes, S., Turner L., Thompson, S., Algerian, N. (June 27th, 2013). The impact of prehospital continuous positive airway pressure on the rate of intubation and mortality from acute out-of-hospital respiratory emergencies. *Prehospital Emergency Care*, 17 (4). Doi: 10.3109/10903127.2013.804138

Frontin, P., Bounes, V., Houzé- Cerfon, C.H., Charpentier, S., Houzé- Cerfon, V., Ducassé, J.L. (September 2011). Continuous positive airway pressure for cardiogenic pulmonary edema: a randomized study. *The American Journal of Emergency Medicine*, 29 (7). Doi: 10.1016/j.ajem.2010.03.007

Willmore, A., Dionne, R., Maloney, J., Ouston, E. (March 24th, 2015). Effectiveness and safety of a prehospital program of continuous positive airway pressure (CPAP) in an urban setting. *Canadian Journal of Emergency Medicine*, 17 (6). Doi: 10.1017/cem.2014.60